

IN THE CLAIMS:

Claim 1 (Canceled)

Claim 2 (Canceled)

Claim 3 (Canceled)

Claim 4 (Canceled)

Claim 5 (Canceled)

Claim 6 (Canceled)

Claim 7 (Canceled)

Claim 8 (Canceled)

Claim 9 (Canceled)

Claim 10 (Canceled)

Claim 11 (Canceled)

Claim 12 (Canceled)

Claim 13 (Canceled)

Claim 14 (Canceled)

Claim 15 (Canceled)

Claim 16 (Canceled)

Claim 17 (Canceled)

Claim 18 (Canceled)

Claim 19 (Canceled)

Claim 20 (Canceled)

Claim 21 (Canceled)

Claim 22 (Canceled)

Claim 23 (Canceled)

Claim 24 (Canceled)

Claim 25 (Canceled)

Claim 26 (Canceled)

Claim 27 (Canceled)

Claim 28 (Canceled)

Claim 29 (Canceled)

Claim 30 (Canceled)

Claim 31 (New) A polyaxial head bone screw assembly for surgical implantation and comprising:

- (a) a shank having a threaded body adapted to be implanted in a bone and a capture end;
- (b) a head having a channel adapted to receive a rod within said channel, said head having a bore formed therethrough sized and shaped to allow uploading of said shank therethrough and so as to receive said shank when assembled;

- (c) said capture end of said shank being operably received within said bore of said head;
- (d) said capture end of said shank has a frusto-conical surface diminishing in diameter toward said shank;
- (e) a retainer ring non integral with said shank and secured on said capture end of said shank so as to rotate with shank relative to said head while in an adjustment configuration and being located within said head to provide a shank and retainer ring structure to retain said capture end within said head and enabling selective angular positioning of said shank with respect to said head, while in said adjustment configuration; said shank and retainer ring structure extending into said channel such that upon assembly the shank and retainer ring structure is sized and shaped to be adapted to directly engage the rod; and
- (f) a closure member operably received in said head in such a manner as to be adapted to engage a rod located within said channel and to urge the rod into engagement with said capture end of said shank in such a manner so as to fixedly position said head relative to such a rod and to secure said head from angular movement relative to said shank, when in a locking configuration.

Claim 32 (New) An assembly as set forth in Claim 31 wherein:

- (a) said retainer ring has a frusto-conical retainer bore formed therethrough to enable mating engagement with said capture end within said retainer bore.

Claim 33 (New) A polyaxial head bone screw assembly for surgical implantation and comprising:

- (a) a shank having a threaded body adapted to be implanted in a bone and a capture end;
- (b) a head having a channel adapted to receive a rod within said channel, said head having a bore formed therethrough sized and shaped to allow uploading of said shank therethrough and so as to receive said shank when assembled;
- (c) said capture end of said shank being operably received within said bore of said head;
- (d) said capture end of said shank has a non-slip formation to enable non-slip engagement with a rod within said channel of said head;
- (e) a retainer ring non integral with said shank and secured on said capture end of said shank so as to rotate with shank relative to said head while in an

adjustment configuration and being located within said head to provide a shank and retainer ring structure to retain said capture end within said head and enabling selective angular positioning of said shank with respect to said head, while in said adjustment configuration; said shank and retainer ring structure extending into said channel such that upon assembly the shank and retainer ring structure is sized and shaped to be adapted to directly engage the rod; and

(f) a closure member operably received in said head in such a manner as to be adapted to engage a rod located within said channel and to urge the rod into engagement with said capture end of said shank in such a manner so as to fixedly position said head relative to such a rod and to secure said head from angular movement relative to said shank, when in a locking configuration.

Claim 34 (New) A polyaxial head bone screw assembly for surgical implantation and comprising:

- (a) a shank having a threaded body adapted to be implanted in a bone and a capture end;
- (b) a head having a channel adapted to receive a rod within said channel, said head having a bore formed

therethrough sized and shaped to allow uploading of said shank therethrough and so as to receive said shank when assembled;

- (c) said capture end of said shank being operably received within said bore of said head;
- (d) said capture end of said shank has a knurled dome to enable non-slip engagement with a rod within said channel of said head;
- (e) a retainer ring non integral with said shank and secured on said capture end of said shank so as to rotate with shank relative to said head while in an adjustment configuration and being located within said head to provide a shank and retainer ring structure to retain said capture end within said head and enabling selective angular positioning of said shank with respect to said head, while in said adjustment configuration; said shank and retainer ring structure extending into said channel such that upon assembly the shank and retainer ring structure is sized and shaped to be adapted to directly engage the rod; and
- (f) a closure member operably received in said head in such a manner as to be adapted to engage a rod located within said channel and to urge the rod into engagement

with said capture end of said shank in such a manner so as to fixedly position said head relative to such a rod and to secure said head from angular movement relative to said shank, when in a locking configuration.

Claim 35 (New) A polyaxial head bone screw assembly for surgical implantation and comprising:

- (a) a shank having a threaded body and a capture end;
- (b) a head having a channel outwardly open and adapted to receive a rod within said channel; said head having a shank mating side with a shank receiving bore formed therethrough; head having a cavity therein open into said bore;
- (c) said capture end of said shank being received within said shank receiving bore of said head;
- (d) said capture end of said shank has a frusto-conical surface diminishing in diameter toward said shank;
- (e) a retainer ring with a split therein to enable resilient expansion and contraction of a diameter of said retainer ring; said retainer ring being received in said head cavity and resiliently receiving said capture end of said shank while within said cavity so as to retain said capture end within said head and

forming a shank and retainer ring structure wherein the retainer ring rotates with said shank enabling selective angular positioning of said shank with respect to said head when in an assembly configuration;

(f) said retainer ring has a frusto-conical retainer bore formed therethrough to enable mating engagement with said capture end within said ring bore; and

(g) a closure member operably mountable within said head in such a manner as to close said channel and adapted to engage a rod within said channel so as to urge such a rod into direct engagement with said shank and retainer ring structure in such a manner as to secure said head from movement relative to such a rod and to secure said head from angular movement relative to said shank and retainer ring structure in a locking configuration.

Claim 36 (New) A polyaxial head bone screw assembly for surgical implantation and comprising:

(a) a shank having a threaded body and a capture end;

(b) a head having a channel outwardly open and adapted to receive a rod within said channel; said head having a shank mating side with a shank receiving bore formed

therethrough; head having a cavity therein open into said bore;

- (c) said capture end of said shank being received within said shank receiving bore of said head;
- (d) a knurled dome formed on said capture end of said shank with a non-slip formation;
- (e) a retainer ring with a split therein to enable resilient expansion and contraction of a diameter of said retainer ring; said retainer ring being received in said head cavity and resiliently receiving said capture end of said shank while within said cavity so as to retain said capture end within said head and forming a shank and retainer ring structure wherein the retainer ring rotates with said shank enabling selective angular positioning of said shank with respect to said head when in an assembly configuration; and
- (f) a closure member operably mountable within said head in such a manner as to close said channel and adapted to engage a rod within said channel so as to urge such a rod into direct engagement with said shank and retainer ring structure in such a manner as to secure said head from movement relative to such a rod and to

secure said head from angular movement relative to said shank and retainer ring structure in a locking configuration.

Claim 37 (New) In a polyaxial head bone screw assembly for surgical implantation and including a shank having a threaded body and a capture end and a head having an outward opening channel open adapted to receive a rod within said channel, said head having a shank receiving bore formed therethrough, the improvement comprising:

- (a) said capture end of said shank being received within said shank receiving bore of said head;
- (b) said capture end of said shank has a frusto-conical surface diminishing in diameter toward said shank;
- (c) a retainer ring that is loaded separately from said shank into said head and being resiliently retained on said capture end of said shank on a side of said bore opposite said shank body within said head to retain said capture end within said head and enabling selective angular positioning of said shank with respect to said head; said shank and retainer ring being joined in a structure within said head such that said retainer ring rotates with said head during the

angular positioning of said shank relative to said head;

(d) said retainer ring has a frusto-conical retainer bore formed therethrough to enable mating engagement with said capture end within said retainer bore upon expansion of said ring with said ring returning to an original diameter after placement on said shank; and

(e) a closure member operably engageable with said head and adapted to engage a rod within said channel so as to be adapted to urge the rod into direct engagement with said shank and retainer ring structure to produce friction between said ring and head as to secure said head from movement relative to such a rod and to secure said head from angular movement relative to said shank and said retainer ring structure in a locking configuration.

Claim 38 (New) In a polyaxial head bone screw assembly for surgical implantation and including a shank having a threaded body and a capture end and a head having an outward opening channel open adapted to receive a rod within said channel, said head having a shank receiving bore formed therethrough, the improvement comprising:

- (a) said capture end of said shank being received within said shank receiving bore of said head;
- (b) said capture end of said shank has a dome formation to enable non-slip engagement with a rod within said channel of said head;
- (c) a retainer ring that is loaded separately from said shank into said head and being resiliently retained on said capture end of said shank on a side of said bore opposite said shank body within said head to retain said capture end within said head and enabling selective angular positioning of said shank with respect to said head; said shank and retainer ring being joined in a structure within said head such that said retainer ring rotates with said head during the angular positioning of said shank relative to said head; and
- (d) a closure member operably engageable with said head and adapted to engage a rod within said channel so as to be adapted to urge the rod into direct engagement with said shank and retainer ring structure to produce friction between said ring and head as to secure said head from movement relative to such a rod and to secure said head from angular movement relative to said shank

and said retainer ring structure in a locking configuration.

Claim 39 (New) In a polyaxial head bone screw assembly for surgical implantation and including a shank having a threaded body and a capture end and a head having an outward opening channel open adapted to receive a rod within said channel, said head having a shank receiving bore formed therethrough, the improvement comprising:

- (a) said capture end of said shank being received within said shank receiving bore of said head;
- (b) said capture end of said shank has a knurled dome having a radius and being adapted to enable non-slip engagement with a rod within said channel of said head;
- (c) a retainer ring that is loaded separately from said shank into said head and being resiliently retained on said capture end of said shank on a side of said bore opposite said shank body within said head to retain said capture end within said head and enabling selective angular positioning of said shank with respect to said head; said shank and retainer ring being joined in a structure within said head such that said retainer ring rotates with said head during the

angular positioning of said shank relative to said head; and

- (d) a closure member operably engageable with said head and adapted to engage a rod within said channel so as to be adapted to urge the rod into direct engagement with said shank and retainer ring structure to produce friction between said ring and head as to secure said head from movement relative to such a rod and to secure said head from angular movement relative to said shank and said retainer ring structure in a locking configuration.